

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors: OLAV SOLGAARD; JONATHAN P. HERITAGE; AMAL R. BHATTARAI  
Serial No.:  
Filed:  
For: MULTI-WAVELENGTH CROSS-CONNECT OPTICAL SWITCH  
Group No.:  
Examiner:  
Docket No.: UC97-156-7

Assistant Commissioner for Patents  
Washington, D.C. 20231

FIRST PRELIMINARY AMENDMENT

Dear Sir:

Please enter the following preliminary amendments in connection with the  
above-identified U.S. patent application which is a continuation of co-pending  
application serial number 09/618,320 filed on July 18, 2000:

IN THE SPECIFICATION:

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Please replace the paragraph beginning on page 1, line 5 with the following:

This application is a continuation of application serial number 09/618,320 filed on July 18, 2000, which is a continuation of application serial number 09/022,591 filed on February 12, 1998, now U.S. Patent 6,097,859, which claims priority from provisional application serial number 60/038,172 filed on February 13, 1997. This application is also related to co-pending application serial number 09/748,025 filed on 12/21/2000, co-pending application serial number 09/766,529 filed on 01/19/2001, and co-pending application serial number 09/780,122 filed on 02/08/2001.

09/618,320

Please replace the paragraph beginning on page 16, line 17 with the following:

Referring now to FIG. 6 and FIG. 7, the fiber-optic switch, being symmetric about its center, can be implemented with a symmetry mirror 58 in the symmetry plane 60. This essentially cuts the component count in half. The output channels may either be on the input fibers and separable by optical rotators (not shown) or on a separate output fiber array (not shown) that is placed above the input array. In the latter case, the micromirror array 62 and the symmetry mirror 58 are slightly tilted about an axis, such that the light is directed to the output fiber array.

FIG. 6

IN THE CLAIMS:

Please cancel Claims 1-30 without prejudice or disclaimer.

09B14460300  
"SHUTTLE"  
09B14460300

Please add the following new claims:

31. An optical switch, comprising an array of actuated mirrors configured for switching an optical beam from an input port to an output port.

32. An optical switch, comprising an array of actuated mirrors configured for switching an optical beam from at least one input port to at least one output port.

33. An optical switch, comprising an array of actuated mirrors configured for switching an optical beam from any input port to any output port.

34. An optical switch, comprising at least one array of actuated mirrors configured for switching an optical beam from an input port to an output port.

35. An optical switch, comprising at least one array of actuated mirrors configured for switching an optical beam from at least one input port to at least one output port.

36. An optical switch, comprising at least one array of actuated mirrors configured for switching an optical beam from any input port to any output port.

37. An optical switch as recited in claim 31, 32, 33, 34, 35, or 36, further comprising means for positioning said optical beam onto at least one array of actuated mirrors.

38. An optical switch as recited in claim 37, wherein said means for positioning comprises at least one lens.

39. An optical switch as recited in claim 31, 32, 33, 34, 35, or 36, further comprising at least one imaging component configured for positioning said optical beam onto at least one array of actuated mirrors.

40. An optical switch as recited in claim 39, wherein said imaging component comprises at least one lens.

41. An optical switch as recited in claim 31, 32, 33, 34, 35, or 36, wherein said optical switch is configured for a specific mirror in at least one array of actuated mirrors to receive an optical beam from a corresponding one specific input port.

42. An optical switch as recited in claim 31, 32, 33, 34, 35, or 36, wherein said optical switch is configured for a specific output port to receive an optical beam from a corresponding one specific mirror in at least one array of actuated mirrors.

43. An optical switch as recited in claim 31, 32, 33, 34, 35, or 36, wherein said optical switch is configured for a specific mirror in at least one array of actuated mirrors to receive an optical beam from a corresponding one specific input port; and

wherein said optical switch is further configured for a specific output port to receive an optical beam from a corresponding one specific mirror in said at least one array of actuated mirrors.

44. An optical switch as recited in claim 31, 32, 33, 34, 35, or 36, wherein at least one array of actuated mirrors comprises a two-dimensional array.

45. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port;
- (c) an array of actuated mirrors configured for switching an optical beam from an input port to an output port.

46. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port; and
- (c) an array of actuated mirrors configured for switching an optical beam from at least one said input port to at least one said output port.

47. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port; and

(c) an array of actuated mirrors configured for switching an optical beam from any said input port to any said output port.

48. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port; and
- (c) at least one array of actuated mirrors configured for switching an optical

beam from an input port to an output port.

49. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port; and
- (c) at least one array of actuated mirrors configured for switching an optical

beam from at least one said input port to at least one said output port.

50. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port; and
- (c) at least one array of actuated mirrors configured for switching an optical

beam from any said input port to any said output port.



51. An optical switch as recited in claim 45, 46, 47, 48, 49, or 50, further comprising means for positioning said optical beam onto at least one array of actuated mirrors.

52. An optical switch as recited in claim 51, wherein said means for positioning comprises at least one lens.

53. An optical switch as recited in claim 45, 46, 47, 48, 49, or 50, further comprising at least one imaging component configured for positioning said optical beam onto at least one array of actuated mirrors.

54. An optical switch as recited in claim 53, wherein said imaging component comprises at least one lens.

55. An optical switch as recited in claim 45, 46, 47, 48, 49, or 50, wherein said optical switch is configured for a specific mirror in at least one array of actuated mirrors to receive an optical beam from a corresponding one specific input port.

56. An optical switch as recited in claim 45, 46, 47, 48, 49, or 50, wherein said optical switch is configured for a specific output port to receive an optical beam from a corresponding one specific mirror in at least one array of actuated mirrors.

57. An optical switch as recited in claim 45, 46, 47, 48, 49, or 50,

wherein said optical switch is configured for a specific mirror in at least one array of actuated mirrors to receive an optical beam from a corresponding one specific input port; and

wherein said optical switch is further configured for a specific output port to receive an optical beam from a corresponding one specific mirror in said at least one array of actuated mirrors.

58. An optical switch as recited in claim 45, 46, 47, 48, 49, or 50, wherein at least one array of actuated mirrors comprises a two-dimensional array.

59. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port;
- (c) an input array of actuated mirrors; and
- (d) an output array of actuated mirrors;
- (e) said input and output arrays of actuated mirrors configured for switching an optical beam from an input port to an output port.

60. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port;
- (c) an input array of actuated mirrors; and

- (d) an output array of actuated mirrors;
- (e) said input and output arrays of actuated mirrors configured for switching

an optical beam from at least one said input port to at least one said output port.

61. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port;
- (c) an input array of actuated mirrors; and
- (d) an output array of actuated mirrors;
- (e) said input and output arrays of actuated mirrors configured for switching

an optical beam from any said input port to any said output port.

62. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port;
- (c) at least one input array of actuated mirrors; and
- (d) at least one output array of actuated mirrors;
- (e) said input and output arrays of actuated mirrors configured for switching

an optical beam from an input port to an output port.

63. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port;

- (c) at least one input array of actuated mirrors; and
- (d) at least one output array of actuated mirrors;
- (e) said input and output arrays of actuated mirrors configured for switching

an optical beam from at least one said input port to at least one said output port.

64. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port;
- (c) at least one input array of actuated mirrors; and
- (d) at least one output array of actuated mirrors;
- (e) said input and output arrays of actuated mirrors configured for switching

an optical beam from any said input port to any said output port.

65. An optical switch as recited in claim 59, 60, 61, 62, 63, or 64, further comprising means for positioning said optical beam onto at least one input array of actuated mirrors.

66. An optical switch as recited in claim 65, wherein said means for positioning comprises at least one lens.

67. An optical switch as recited in claim 59, 60, 61, 62, 63, or 64, further comprising at least one imaging component configured for positioning said optical beam onto at least one input array of actuated mirrors.

68. An optical switch as recited in claim 67, wherein at least one imaging component comprises at least one lens.

69. An optical switch as recited in claim 59, 60, 61, 62, 63, or 64, wherein said optical switch is configured for a specific mirror in at least one input array of actuated mirrors to receive an optical beam from a corresponding one specific input port.

70. An optical switch as recited in claim 59, 60, 61, 62, 63, or 64, wherein said optical switch is configured for a specific output port to receive an optical beam from a corresponding one specific mirror in at least one output array of actuated mirrors.

71. An optical switch as recited in claim 59, 60, 61, 62, 63, or 64,  
wherein said optical switch is configured for a specific mirror in at least one input array of actuated mirrors to receive an optical beam from a corresponding one specific input port; and

wherein said optical switch is further configured for a specific output port to receive an optical beam from a corresponding one specific mirror in at least one output array of actuated mirrors.

72. An optical switch as recited in claim 59, 60, 61, 62, 63, or 64, wherein each mirror in at least one input array of actuated mirrors is configured to steer an incident optical beam to any, but not more than one for a given setting, mirror in at least one output array of actuated mirrors.

73. An optical switch as recited in claim 59, 60, 61, 62, 63, or 64, wherein each output mirror in at least one output array of actuated mirrors can be set to receive an optical beam from any, but not more than one for a given setting, mirror in at least one input array of actuated mirrors.

74. An optical switch as recited in claim 59, 60, 61, 62, 63, or 64, wherein each mirror in at least one input array of actuated mirrors is configured to steer an incident optical beam to any, but not more than one for a given setting, mirror in at least one output array of actuated mirrors; and

wherein each output mirror in at least one output array of actuated mirrors can be set to receive an optical beam from any, but not more than one for a given setting, mirror in at least one input array of actuated mirrors.

75. An optical switch as recited in claim 59, 60, 61, 62, 63, or 64, wherein at least one array of actuated mirrors comprises a two-dimensional array.

76. An optical switch as recited in claim 59, 60, 61, 62, 63, or 64, wherein at least one output array of actuated mirrors is spatially separated from at least one input array of actuated mirrors.

77. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port;

- (c) an input array of actuated mirrors;
- (d) an output array of actuated mirrors; and
- (e) at least one imaging component configured for positioning said optical beam onto said input array of actuated mirrors;
- (f) wherein said optical switch is configured for a specific mirror in said input array of actuated mirrors to receive an optical beam from a corresponding one specific input port; and
- (g) wherein said optical switch is further configured for a specific output port to receive an optical beam from a corresponding one specific mirror in said output array of actuated mirrors.

78. An optical switch, comprising:
- (a) at least one input port;
- (b) at least one output port;
- (c) a least one input array of actuated mirrors;
- (d) at least one output array of actuated mirrors; and
- (e) at least one imaging component configured for positioning said optical beam onto at least one input array of actuated mirrors;
- (f) wherein said optical switch is configured for a specific mirror in an input array of actuated mirrors to receive an optical beam from a corresponding one specific input port; and

(g) wherein said optical switch is further configured for a specific output port to receive an optical beam from a corresponding one specific mirror in an output array of actuated mirrors.

79. An optical switch, comprising:

(a) at least one input port;

(b) at least one output port;

(c) a least one input array of actuated mirrors;

(d) at least one output array of actuated mirrors; and

(e) at least one imaging component configured for positioning said optical beam onto at least one input array of actuated mirrors;

(f) wherein said optical switch is configured for a specific mirror in at least one input array of actuated mirrors to receive an optical beam from a corresponding one specific input port; and

(g) wherein said optical switch is further configured for a specific output port to receive an optical beam from a corresponding one specific mirror in at least one output array of actuated mirrors.

80. An optical switch as recited in claim 77, 78, or 79, wherein at least one imaging component comprises at least one lens.



81. An optical switch as recited in claim 77, 78, or 79, wherein each mirror in at least one input array of actuated mirrors is configured to steer an incident optical beam to any, but not more than one for a given setting, mirror in at least one output array of actuated mirrors.

82. An optical switch as recited in claim 77, 78, or 79, wherein each output mirror in at least one output array of actuated mirrors can be set to receive an optical beam from any, but not more than one for a given setting, mirror in at least one input array of actuated mirrors.

83. An optical switch as recited in claim 77, 78, or 79,  
wherein each mirror in at least one input array of actuated mirrors is configured to steer an incident optical beam to any, but not more than one for a given setting, mirror in at least one output array of actuated mirrors; and

wherein each output mirror in at least one output array of actuated mirrors can be set to receive an optical beam from any, but not more than one for a given setting, mirror in at least one input array of actuated mirrors.

84. An optical switch as recited in claim 77, 78, or 79, wherein at least one array of actuated mirrors comprises a two-dimensional array.

85. An optical switch as recited in claim 77, 78, or 79, wherein at least one output array of actuated mirrors is spatially separated from at least one input array of actuated mirrors.

86. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port;
- (c) an input array of actuated mirrors;
- (d) an output array of actuated mirrors; and
- (e) at least one imaging component configured for positioning said optical

beam onto said input array of actuated mirrors;

(f) wherein each mirror in said input array of actuated mirrors is configured to steer an incident optical beam to any, but not more than one for a given setting, mirror in said output array of actuated mirrors; and

(g) wherein each output mirror in said output array of actuated mirrors can be set to receive an optical beam from any, but not more than one for a given setting, mirror in said input array of actuated mirrors.

87. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port;
- (c) at least one input array of actuated mirrors;

- (d) at least one output array of actuated mirrors; and
- (e) at least one imaging component configured for positioning said optical beam onto at least one input array of actuated mirrors;
- (f) wherein each mirror in an input array of actuated mirrors is configured to steer an incident optical beam to any, but not more than one for a given setting, mirror in an output array of actuated mirrors; and
- (g) wherein each output mirror in an output array of actuated mirrors can be set to receive an optical beam from any, but not more than one for a given setting, mirror in an input array of actuated mirrors.

88. An optical switch, comprising:

- (a) at least one input port;
- (b) at least one output port;
- (c) at least one input array of actuated mirrors;
- (d) at least one output array of actuated mirrors; and
- (e) at least one imaging component configured for positioning said optical beam onto at least one input array of actuated mirrors;
- (f) wherein each mirror in at least one input array of actuated mirrors is configured to steer an incident optical beam to any, but not more than one for a given setting, mirror in at least one output array of actuated mirrors; and
- (g) wherein each output mirror in at least one output array of actuated mirrors can be set to receive an optical beam from any, but not more than one for a given setting, mirror in at least one input array of actuated mirrors.

89. An optical switch as recited in claim 86, 87, or 88, wherein at least one imaging component comprises at least one lens.

90. An optical switch as recited in claim 86, 87, or 88, wherein at least one array of actuated mirrors comprises a two-dimensional array.

91. An optical switch as recited in claim 86, 87, or 88, wherein at least one output array of actuated mirrors is spatially separated from at least one input array of actuated mirrors.

92. An optical switch as recited in claim 86, 87, or 88, wherein said optical switch is configured for a specific mirror in at least one input array of actuated mirrors to receive an optical beam from a corresponding one specific input port.

93. An optical switch as recited in claim 86, 87, or 88, wherein said optical switch is configured for a specific output port to receive an optical beam from a corresponding one specific mirror in at least one output array of actuated mirrors.

94. An optical switch as recited in claim 86, 87, or 88,  
wherein said optical switch is configured for a specific mirror in at least one input array of actuated mirrors to receive an optical beam from a corresponding one specific input port; and

wherein said optical switch is further configured for a specific output port to receive an optical beam from a corresponding one specific mirror in at least one output array of actuated mirrors.

TOP SECRET

## REMARKS

This Preliminary Amendment is being submitted in connection with a continuation of copending application serial number 09/618,320 filed on July 18, 2000.

Entry is respectfully requested.

A telephone interview is respectfully requested prior to the first action on the merits.

09/618,320

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE SPECIFICATION:**

The paragraph beginning on page 1, line 5 has been amended as follows:

This application [claims priority from U.S. provisional application serial number 60/038,172 filed on February 13, 1997] is a continuation of application serial number 09/618,320 filed on July 18, 2000, which is a continuation of application serial number 09/022,591 filed on February 12, 1998, now U.S. Patent 6,097,859, which claims priority from provisional application serial number 60/038,172 filed on February 13, 1997. This application is also related to co-pending application serial number 09/748,025 filed on 12/21/2000, co-pending application serial number 09/766,529 filed on 01/19/2001, and co-pending application serial number 09/780,122 filed on 02/08/2001.

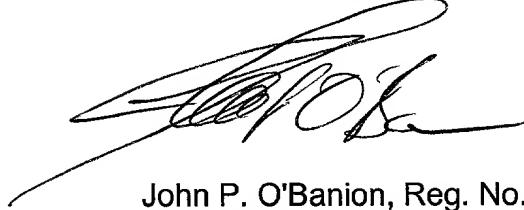
The paragraph beginning on page 16, line 17 has been amended as follows:

Referring now to FIG. 6 and FIG. 7, the fiber-optic switch, being symmetric about [it's] its center, can be implemented with a symmetry mirror 58 in the symmetry plane 60. This essentially cuts the component count in half. The output channels may either be on the input fibers and separable by optical rotators (not shown) or on a separate output fiber array (not shown) that is placed above the input array. In the latter case, the micromirror array 62 and the symmetry mirror 58 are slightly tilted about an axis, such that the light is directed to the output fiber array.

Date:

3/20/01

Respectfully submitted,



John P. O'Banion, Reg. No. 33,201  
O'BANION & RITCHEY LLP  
400 Capitol Mall, Suite 1550  
Sacramento, CA 95814  
(916) 498-1010

1002220 04461860